

**We claim:**

1. A ~~[[D]]~~detector for varying pressure ranges in a specimen chamber of a particle beam device, wherein the detector is arranged and adapted for the detection of electrons and ~~also for the detection of light~~.
2. The ~~[[D]]~~detector according to claim 1, wherein the detector comprises a scintillator (3) to which a high voltage potential is applicable, and a photodetector (4), and the scintillator (3) ~~is made~~ being made at least partially permeable to light.
3. The ~~[[D]]~~detector according to claim 2, wherein the scintillator (3) ~~has~~ comprises an electrically conductive coating in grid or strip form.
4. The ~~[[D]]~~detector according to claim 2, wherein the scintillator (3) ~~has~~ comprises an electrically conductive coating ~~which~~ that is permeable to light.
5. The ~~[[D]]~~detector according to ~~one of claims 1-4~~ claim 1, wherein further comprising a light guide (2) ~~is provided~~.
6. The ~~[[D]]~~detector according to claim 5, wherein the light guide (2) ~~consists of~~ comprises scintillator material.
7. The ~~[[D]]~~detector according to ~~one of claims 2-5~~ claim 2, wherein ~~a~~ further comprising a collector electrode (5) ~~is provided~~, connected before the scintillator.
8. The ~~[[D]]~~detector according to claim 7, wherein the scintillator (3) and the collector electrode (5) ~~can have controllable potentials applied~~ are controllable potentials, independently of each other.
9. The ~~[[D]]~~detector according to claim 7 ~~or 8~~, wherein the collector electrode (5) ~~can have a variable potential applied~~ is arranged and adapted for application of a variable potential, positive with respect to the sample potential.

10. The [[D]]detector according to ~~one of claims 7-9~~ claim 7, wherein ~~current amplifiers are connected to the collector grid (5) and/or to the conductive coating (4) of the scintillator(3)~~ the scintillator comprises a conductive coating, further comprising current amplifiers that are connected to at least one of the collector grid and to the conductive coating of the scintillator.

11. The [[D]]detector according to ~~one of claims 8-10~~ claim 8, wherein the conductive coating (4) of the scintillator ~~(3) is arranged and adapted to have~~ has a potential applied with respect to the collector electrode (5) so that a gas cascade arises between the collector electrode (5) and the conductive coating (4).

12. The [[D]]detector according to ~~one of claims 1-11~~ claim 1, wherein further comprising a an needle electrode (24) or an electrode of thin wires ~~is provided on the~~ a sample side of the scintillator.

13. The [[D]]detector according to ~~one of claims 1-12~~ claim 1, wherein ~~an electrode (20, 22) surrounding the scintillator~~ further comprising a scintillator and an electrode surrounding the scintillator ~~is provided~~ in a form of a pot ~~which~~ that tapers conically to a point on ~~the~~ a side remote from the scintillator and ~~has~~ comprises an opening (21, 23) on ~~the~~ a side remote from the scintillator.

14. A [[P]]particle beam device, particularly a scanning electron microscope, with compris-ing a sample chamber (29), ~~the chamber pressure of which is variable~~ with a variable pressure, with an electron optical system for the production of a focused electron beam (PE) and with a detector according to ~~one of claims 1-13~~ claim 1.

15. The [[P]]particle beam device according to claim 14, further comprising a pressure meter ~~(12) is provided~~ in the sample chamber and so that the application of potential to the scintillator takes place in dependence on the pressure in the sample chamber (29).

16. The [[P]]particle beam device according to claim 15, wherein that is arranged and adapted so that at pressures in the sample chamber below a changeover pressure between  $10^{-3}$  hPa and  $10^{-2}$  hPa, a potential of greater than 1 kV positive with respect to the potential of the sample is applied to the scintillator, and at pressures in the sample chamber above the changeover pressure, a potential quantitatively smaller than 1 kV, ~~preferably smaller than 0.5 kV~~, positive with respect to the potential of the sample is applied to the scintillator.

17. The [[P]]particle beam device according to claim 15 or 16, wherein the sign of the potential of the collector electrode may be reversed is reversible.

18. The [[P]]particle beam device according to claim 16 or 17, wherein that is arranged and adapted so that at pressures above the changeover pressure in the sample chamber, a potential of 0 V or  $\pm 400$  V with respect to the potential of the sample is applied to the collector electrode.

19. A [[M]]method for the detection of the products of reciprocal effects in a particle beam device under variable pressure conditions, wherein comprising the step that under high vacuum conditions the light arising when the products of interaction strike a scintillator, and the step that at ambient pressure or low vacuum conditions, the light arising when the products of interaction interact with gas molecules, are detected with the same photodetector (1) and then evaluated.

20. The [[M]]method according to claim 19, wherein comprising the step of using a detector according to one of claims 1-13 is used claim 1.

21. (New) The particle beam device according to claim 16, wherein the potential is quantitatively smaller than 0.5 kV.